2011 International Conference on Biology, Environment and Chemistry
IPCBEE vol.24(2011) © (2011)IACSIT Press, Singapoore

Studies on the wetland biodiversity conservation with reference to food, abundance and resource utilization by three species of herons

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Abstract. The present study examines the habitat use, habitat characteristics and abundance of three species of herons (Cattle egret, Little Egret and Pond heron) in seven wetland habitats in Malappuram and Kozhikode districts, Kerala, India. The use of various micro-habitats of wetlands by the species, the threats to the wetlands in the study area and need for their conservation for survival of these bird species are highlighted.

Keywords: wetland, micro-habitat, cattle egret, little egret, pond heron

1 Introduction

Wetlands are the ideal habitats of herons, which are basically adapted to feed by wading in shallow water. Some heron species typically use dry land, while others use it facultatively. Wetlands are themselves diverse and changeable (Kushlan 2000). Distribution of herons (Order Ciconiiformes, family Ardeidae), the most common group of birds in wetlands, is influenced mainly by prey abundance, and suitable feeding sites and vegetation cover rather than the plant species that are present there. Most herons are flexible in their ability to make use of different shallow aquatic habitats. This flexibility is crucial for the success of this group of birds. Paddy fields and other forms of wetlands are fast depleting in the Kerala State, India, for rapid socio-economic changes and conservation of these habitats is becoming of utmost importance. Since these wetlands being vital for egrets and herons, the present study has much significance.

2 Methods

We studied habitat use, habitat characteristics and abundance of three species of herons namely Cattle egret, Little Egret and Pond heron in seven wetland habitats of Malappuram and Kozhikode districts, Kerala, India, as part of a larger study on the ecology and biology of wetland birds during 1999-2001. In each habitat (table 1), every week, walking along a fixed route we counted the birds within a 100x100 m area. Five counts were made during 06h00 to 18h00 per day. Habitats in the study area were classified on the basis of dominant plant community and water regime. Habitat characteristics were quantified by monthly survey; 0.5x0.5m, 5x5m and 10x10m quadrats were laid to assess herbs, shrubs and trees respectively (Ramachandran and Vijayan 1992). Gut contents of the birds were also analyzed to relate their habitat preference with prey abundance. Gut content of dead specimens and regurgitated boluses of the nestlings of Little egret and Pond herons were analyzed following Barbraud et al. (2001).

Aquatic organisms were assessed by sweeping a "D" frame nylon cloth net with 0.5m diameter (Saksena and Kausik 1994). Data on aquatic organisms were collected from all the seven habitats. Aquatic insects and fishes were identified following Elzinga (1978) and Talwar and Jhingran (1991). Of seven habitats, the abundance and percentage composition of birds in three jheels were pooled together (Azhinjilam, Calicut and

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Feroke) as one unit and the other four habitats were studied as separate units. Habitat loss was estimated by travelling along the sides of the study areas splitting them into stretches of one kilometer distance.

3 Results

The habitat characteristics in the study area are given in the table 1. All the habitats were seasonally flooded and were vegetated mostly with plants that were aquatic or highly tolerant to flooding.

Table-1 Important features of habitats under study

Habitat	Location	Features	Major flora	Major fauna
Azhinjilam jheel (shallow water body)	Azhinjilam, Malappuram district 11° 11′ 55.8″ N, 75° 52′ 04.5″ E	30 ha; flooded June-November; max 2m deep	*Salvinia molesta* (31%), *Oryza sp.* (24%), *Cynodon dactylon* (18%), *Hydrilla verticillata* (14%), and *Nymphoides hydrophylla* (13%).	**Aquatic**-*Macropodus cupanus* (31%), *Puntius vittatus* (17%), *Danio aequipinnatus* (11%), Palaemon sp. (21%) and Dragonfly naiad (20%). **Terrestrial**- Acrididae (36%), Gryllidae (18%), Tettigoniidae (15%) Cicadellidae (11%), Lestidae (14%) and Apidae (6%).
Calicut jheel	Calicut city, Kozhikode district, 11°15′32.8″N, 75°47′22.4″ E	30 ha; flooded June-November; max 1.2m deep	*Eichhornia crassipes* (20%), *Salvinia molesta* (12%), *Ipomea aquatic* (33%), *Alternanthera philoxeroides* (31%) and *Lemna* sp. (4%),	**Aquatic**- Belostomatidae (35%), Pleiidae (19%), *Macropodus cupanus* (18%), Naiads of Damselflies (14%) and dragonflies (14%).
Feroke jheel	Feroke, Kozhikode district, 11° 10′ 52.9″ N, 75° 50′ 48.5″ E	10 ha; flooded June-November; max 1.5m deep	*Digitaria bicornis* (7%), *Nymphaea stellata* (12%), *Ipomea carnea* (32%), *Hydrilla verticillata* (26%), *Oryza* sp. (23%).	**Aquatic**- *Danio aequipinnatus* (36%), *Puntius vittatus* (21%), *Palaemon* sp. (19%), Planorbidae (13%) and *Aplocheilus blockii* (11%).
Karimpuzha river	Karimpuzha, Nilambur Municipality, 11° 18′ 20.2″ N, 76° 15′ 17.8″ E	10 ha; flooded in June-November; max 5m deep	*Cyperus* sp. (20%), *Fimbristylis mileacea* (22%), *Cynodon dactylon* (8%), *Paspalum conjugatum* (10%), *Paspalum scrobiculatum* (12%), *Cyrtococcum* sp. (13%), *Eragrostis unioloides,*(9%), and *Sphaeranthus africanus* (6%)	**Aquatic**- *Palaemon* sp. (57%), *Puntius amphibius* (16%), *Tetraodon travancoricus* (10%), *Danio aequipinnatus* (10%) and Dragonfly naiad (7%).
Kadalundy river	Kallampara, Feroke Panchayath, Kozhikode distrct, 11° 09′ 25.5″ N, 75° 51′ 02.0″ E	10 ha; estuarine, subjected to flow and ebb; flooded June-November; max 3.5m deep	*Entermorpha* sp. (28%), *Avicennia marina* (27%), *Acanthus ilicifolius* (23%), and *Sphaeranthus indica* (22%).	**Aquatic-** *Penaeus* sp. (39%), *Macrobrachium* sp. (26%), *Aplocheilus blockii* (17%), *Danio aequipinnatus* (10%) snd *Puntius amphibius* (8%)
Wet grass field	Vadapuram, Mampad Panchayath, Malappuram district 11° 15′ 21.4″ N, 76° 11′ 58.0″ E	10 ha; abandoned paddy field overgrown with grass; floods in monsoon	*Cyrtococcum trigonum* (34%), *Ischaemum* sp. (20%), *Sporobolus diander* (18%), *Fimbristylis miliacea* (16%) and *Eragrostis viscosa* (12%).	**Aquatic**-*Danio aequipinnatus* (30%), Dragonfly naiad (21%), Notonectidae (19%), *Palaemon* sp. (16%) and Hydrophilidae (14%). **Terrestrial**- Acrididae (35%), Gryllidae (21%), Lestidae (17%), Pyralidae (14%) and Formicidae

				(13%).
Paddy field	Mampad, Malappuram district 11° 14′ 23.5″ N, 76° 11′ 46.8″ E	10 ha; first crop: June-September; Second crop: Oct-Feb; Cultivates in monsoon season	*Oryza sativa* (71%), *Echinochloa colonum* (8%), *Eriocaulon quinquangulare* (10%), *Cynodon dactylon* (4%), *Ischaemum* sp. (6%) and *Eragrostis unioloides* (1%).	**Aquatic-** *Macropodus cupanus* (20%), Tadpoles (34%), *Pila globosa* (26%) , Dragonfly naiad (12%), *Puntius vittatus* (8%), **Terrestrial**- Acrididae (26%), Pyraustidae (25%), Formicidae (17%), Cicadellidae (16%) and Tetrigidae (16%).

3.1. Birds

Comparative abundance of cattle egret, little egret and Pond heron in different habitats are given in Table-2. Of the various habitats, pond herons have highest preference for jheels than other habitats. Among the three species, pond herons constitute 52.3% in this habitat. Among the various habitats, the most preferred habitat of little egret is Kadalundy estuarine habitat (52.9%). Their number is rather less in wet grass field which is shallow and flooded only for a short period of time, July to November. Cattle egret prefers almost all habitats except estuarine areas of Kadalundy. Their most preferred habitats are grass fields (58.9%) and Paddy fields (58.8%).

Table-2 Comparative abundance of the three species of birds in different habitats

	HABITATS				
Bird species	**Paddy field**	**Wet Grass field**	**Jheel**	**Karimpuzha river**	**Kadalundi estuary**
	%	**%**	**%**	**%**	**%**
Cattle Egret	58.83	58.93	29.88	31.13	.00
Little Egret	12.18	3.29	17.79	27.63	52.94
Pond Heron	28.99	37.78	52.33	41.25	47.06
Total	100.00	100.00	100.00	100.00	100.00

3.2. Flora and fauna of the habitats

Of the seven habitats, Azhinjilam jheel, wet grass field and paddy field have both aquatic and a considerable portion of exposed terrestrial domain. Hence, these habitats harbor both aquatic and terrestrial organisms (Table-1). The percentage composition of the most common flora and fauna of the habitats is also shown in the table.

3.3. The food spectrum of herons

The food of adult pond heron comprises of insects (71.7 %), annelids (14.7 %), tadpoles (4.7 %), crustaceans (3.8%), fishes (2.7 %), arachnids (1.2 %) and reptiles (1.2 %). In the case of the nestlings of pond herons the food composition was fishes (62.5%), insects (22.5%), tadpole (10%), arachnids (2.5%) and crustaceans (2.5%). For adult little egrets the prey items were fishes (96.2 %), insects (3.6 %) and amphibians (0.19%), while that of the nestlings are fishes (91.3 %), insects (4.1 %), amphibians and crustaceans each (1.4 %) and miscellaneous items (1.9 %). The food items of adult Cattle egrets included insects (87%), arachnids (5%), diplopods (1%), mammals (1%) and miscellaneous forms (6%).

4 Discussion

Since the major portion of the food of Pond herons and Cattle egrets is insects, as proved from their gut content analysis, they frequent all the above habitats, especially the terrestrial margins covered with vegetation, and prey upon the terrestrial organisms. While foraging they also try for aquatic organisms. Distributions of terrestrial organisms, which are mostly habitat specific, at the margins of wetlands, depend upon the availability of diverse vegetation (Kushlan 2000). Cattle Egret and Pond herons prefer short-grass margins at damp places especially flood plains facing seasonal flooding and slow drying (Siegfried 1988). Fishes being the major food of Little Egret and a variety of fishes being present in fresh water (Karimpuzha

river) and estuarine (Kadalundy river) habitats they prefer such habitats to other non-riverine areas. Wong et al. (2001) also reports that shallow coastal waters and mudflats were the most important habitats at low tide for Little Egrets (*Egretta garzetta*). Fish trapped in pools during retreating tides in summer at Kadalundy estuarine habitat was a major attraction for little egrets (Weller 1994, Seedikkoya 2003). Fishes were also available in paddy fields, jheels and wet grass field in monsoon (July-September) and up to December. Little egrets also make use of the terrestrial margins covered with vegetation. The presence of minor portion of insects and other terrestrial organisms in their food also supports this observation.

4.1. Need for conservation

Since the food spectrum of these herons contain a variety of prey items from diverse habitats, these herons and their nestlings can't survive unless such habitats are conserved. It is observed that after a decade since this study was completed in 2001, in every stretch of 1 km transect in each of the above seven study sites, more than half have been converted built up areas; shopping complexes, residences, Automobile workshops, industrial units, highways and warehouses, depleting the niches of the herons. Anthropogenic pressure is so high that unless appropriate steps are taken for conservation, these habitats would be lost permanently depleting the population of herons.

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